

Required Courses for the Biochemical Engineering Degree

This program is accredited by the Engineering Accreditation Commission of ABET, <http://www.abet.org>

Undergraduate Advising: Email: ech-advising@ucdavis.edu

To make an advising appointment, please visit: appointments.ucdavis.edu

Note: Curriculum and course offerings are subject to change. You must fulfill the degree requirements stated in the catalog of the year you graduate or the year immediately prior. For additional detail on degree requirements and coursework, please visit: <https://ucdavis.pubs.curricUNET.com/Catalog/biochemical-engineering>

Writing and General Education Requirements

Lower Division Composition (4 units)

Select **ONE** of the following courses:

UWP 1, 1V, or 1Y	Expository Writing
ENL 3	Introduction to Literature
COM 1	Bks of West Civ /Ancient World
COM 2	Bks of West Civ/MidAge-Enligh.
COM 3	Bks of West Civ/Modern Crisis
COM 4	Bks of Contemporary World
NAS 5	Intro to Native American Lit.

Courses must be completed with a C- or better. A 4 or 5 on your AP English exam will also satisfy this requirement

Upper Division Composition (0 or 4 units)

Select **ONE** of the following courses:

UWP 102E or 102F	Writing in the Disciplines
UWP 104A, 104E, or 104T	Writing in the Professions

Course must be completed with a C- or better. This requirement can also be satisfied by passing the [Upper Division Composition Exam](#).

General Education Requirement

This requirement is partially satisfied with coursework completed for the Biochemical Engineering degree. A detailed GE checklist can be found [here](#).

Lower Division Major Requirements

Math, Physics, Chemistry and Biology (57 units)

Course	Description	Units	Quarter Offered			Prerequisites
MAT 21A	Calculus	4	F	W	S	Two years of high school algebra, plane geometry, plane trigonometry, and analytical geometry, and satisfying the Mathematics Placement Requirement
MAT 21B	Calculus	4	F	W	S	C- or better in MAT 21A or C- or better in MAT 21AH
MAT 21C	Calculus	4	F	W	S	C- or better in MAT 21B or C- or better in MAT 21BH
MAT 21D	Vector Analysis	4	F	W	S	C- or better in MAT 21C or C- or better in MAT 21CH
MAT 22A	Linear Algebra	3	F	W	S	C- or better in MAT 21C or MAT 21CH; ENG 6, EME 5, ECH 60, or MAT 22AL ☺
MAT 22B	Differential Equations	3	F	W	S	C- or better in MAT 22A or MAT 67
PHY 9A	Classical Physics	5	F		S	MAT 21B or 📖
PHY 9B	Classical Physics	5	F	W		PHY 9A; MAT 21C; MAT 21D ☺
PHY 9C	Classical Physics	5		W	S	PHY 9B; MAT 21D; MAT 22A ☺
CHE 2A	General Chemistry	5	F	W		24+ on Chemistry Placement Exam
CHE 2B	General Chemistry	5		W	S	C- or better in CHE 2A or 2AH
CHE 2C	General Chemistry	5	F		S	C- or better in CHE 2B or 2BH
BIS 2A	Introductory Biology	5	F	W	S	None

Engineering (12 units)

ECH 5	BioChem/Materials Analysis	3		W		MAT 21A, MAT 21B ☺
ECH 60	Computational Methods	4			S	MAT 21C
ECH 51	Material Balances	4	F			C- or better in MAT 21C; MAT21D ☺
ECH 80	Chemical Engineering Professionalism (SS GE3 credit)	1	F			None

Upper Division Major Requirements

Chemistry and Biological Science (20 units)

Course	Description	Units	Quarter Offered			Prerequisites
CHE 128A	Organic Chemistry	3	F	W		C or better in CHE 2C
CHE 129A	Organic Chemistry	2	F	W		C or better in CHE 2C, CHE 128A ☺
CHE 128B	Organic Chemistry	3		W	S	CHE 128A or ☐, 129A
CHE 110A	Quantum Mechanics	4	F		S	PHY 9C or PHY 9HC; CHE 2C or CHE 2CH; Completion of MAT 21D, MAT 22A, MAT 22AL, and PHY 9C or PHY 9HC strongly recommended
BIS 102	Struc & Func Biomolecules	3	F	W	S SS	BIS 1A or 2A; CHE 8B, CHE 118B, or CHE 128B
MIC 102	Intro Microbiology	3	F	W	S	BIS 1A or BIS 2A; CHE 2B ☺
MIC 103L	Intro Microbiology Lab	2	F	W	S	C- or better in MIC 102; CHE 2B

Engineering core courses (60 units)

Course	Description	Units	Quarter Offered			Prerequisites
ECH 140	Mathematical Methods	4	F			MAT 22B; ECH 60, ENG 6, or equivalent
ECH 141	Fluid Mechanics	4		W		C- or better in ECH 51; ECH 140
ECH 142	Heat Transfer	4			S	ECH 141
ECH 143	Mass Transfer	4			S	ECH 141
ECH 145A	Chemical Engineering Thermodynamics Lab	3		W		ECH 152A, ECH 152B ☺
ECH 145B	Chemical Engineering Transport Lab	3			S	ECH 141, ECH 145A
ECH 148A	Chemical Kinetics and Reaction Engineering	3	F			ECH 143, ECH 152B No credit given for students who have taken ECH 146
ECH 152A	Thermodynamics	3	F			ECH 60, ENG, or equivalent
ECH 152B	Thermodynamics	4		W		ECH 152A, no credit given for students who have taken ENG 105.
ECH 157	Process Dynamics	4	F			ECH 140
ECH 158A	Process Economics and Green Design (SS GE3 credit)	4	F			ECH 142, ECH 143
ECH 158C	Plant Design Project (SS GE3 credit)	4			S	ECH 158B or ECH 161C
ECH 161A	BiochemE Fundamentals	4		W		ECH148A
ECH 161B	Bioseparations	4		W		ECH 143
ECH 161C	Biotech Facility Design (SS GE3 credit)	4		W		ECH 161A ☺ and ECH 161B ☺; or MCB 263 ☺
ECH 161L	Bioprocess Engineering Lab	4			S	(ECH 161A & B, and ECH 145B) or VEN 186, or (BIS 103 & MCB 120L)

Biochemical Engineering Electives (9 units)

Choose at least one laboratory course from the Laboratory Elective list; additional courses may be chosen from either list. You may receive biochemical engineering elective credit up to a maximum of two units of an internship (192) or independent study (199), or Biotechnology 189L with the approval of a petition, provided that the course is a laboratory-based experimental project, related to the biological and/or biochemical engineering sciences, and the student submits a written report that demonstrates proficiency in laboratory skills, techniques, or method. Research does not replace the required lab elective.

Please note that the quarters in which the following courses are offered are subject to change. Please plan ahead by checking Schedule Builder to see if the course will be offered the following quarter or by checking with the major advisor in the appropriate department

Course	Description	Units	Quarter Offered			Prerequisites
BIS 2B	Introductory Biology	5	F	W	S	None; Not open for credit to students who have completed BIS 1B with a grade of a C- or better
BIS 2C	Introductory Biology	5	F	W	S SS	C- or better in BIS 1B or 2B
BIS 101	Genes & Gene Expression	4	F	W	S SS	C- or better in BIS 2A and BIS 2B; CHE 8A, CHE 118A, or CHE 128A; (STA 13 or STA 13Y) or STA 100, STA 102, or STA 130A; STA 100 preferred
BIS 103	Bioenergetics & Metabolism	3	F	W	S SS	BIS 102
BIS 104	Cell Biology	3	F	W	S	BIS 101; BIS 102 or BIS 105
BIM 102	Quantitative Cell Biology	4	F			BIS 2A; CHE 8B or CHE 118B; Only open to College of Engineering students
BIM 107*	Mathematical Methods for Biological Systems	4				C- or better in ENG 6; BIM 20; MAT 22B. Restricted to Biomedical Engineering majors only.
BIM 109	Biomaterials	4			S	BIS 2A; CHE 2C; BIM 106, Restricted to upper division engineering majors

BIM 117**	Molecular and Cellular Networks	4	F		C- or better in BIS 2A and MAT 22A, Upper division standing
BIM 140**	Protein Engineering	4		S	BIS 2A
BIM 161A**	Biomolecular Engineering	4	F		BIS 2A; CHE 8B or CHE 118B; Upper division standing
BIM 162	Biophysics of Molecules and Cells	4	F		C- or better in MAT 22B and PHY 9C
BIT 160	Principles of Plant Biotechnology	3		W	BIS 1A or 2A; BIS 101 or PLS 152
BIT 188	Undergraduate Research: Proposal	3		S	Upper division standing
CHE 130A	Pharmaceutical Chemistry	3		W	CHE 118C or 128C
CHE 130B	Pharmaceutical Chemistry	3		S	CHE 130A ☺
EBS 165	Bioinstruments and Control	4	F		ENG 100
ECH 144*	Rheology and Polymer Processing	3		S	ECH 141
ECH 166	Catalysis	3		S	ECH 148A and 📖
ECH 170*	Introduction to Colloid and Surface Phenomena	3		S	CHE 110A
FST 102A	Malting and Brewing Science	4	F		(BIS 102 and 103) or BIS 105; Senior standing recommended
FST 104	Food Microbiology	3		W	BIS 2A, 103, MIC 102 and MIC 103L
FST 123	Intro. to Enzymology	3		S	FST 123L ☺
MIC 140*	Bacterial Physiology	3	F		(BIS 101, 102, 103 ☺) or (BIS 101, 105; MIC 102 recommended)
MIC 150	Genomes of Pathogenic Bacteria	3		S	MIC 102; BIS 101
MCB 123	Behavior and Analysis Enzymes and Receptor Systems	3	F	S	BIS 103
NPB 101	Systemic Physiology	4	F	S	BIS 1A or 2A; CHE 2B; PHY 1B or 7C strongly recommended.
NPB 107	Cell Signaling in Health and Disease	3		W	S BIS 102 or 105
PLB 112	Plant Growth & Development	3		W	BIS 2A, 2B, and 2C; CHE 8B or 118B; BIS 101
PLS 100A	Metabolic Processes of Cultivated Plants	3	F		PLS 2 or BIS 1C or 📖
PLS 152	Plant Genetics	4	F		BIS 1A or 2A or 📖
STA 130A	Mathematical Statistics: Brief Course	4	F		MAT 16C or 17C or 21C
STA 131A	Introduction to Probability Theory	4	F	S	MAT 21B; MAT 21C; MAT 22A or MAT 67
VEN 123	Analysis of Musts and Wines	2	F		CHE 2C; CHE 8B, CHE 118B, or CHE 128B; PLS 21
VEN 124	Wine Production	2	F		VEN 3, (VEN 123 ☺), BIS 102

Lab Electives

BIM 161L*	Biomolecular Engineering Lab	3			BIM 161A or BIS 101
BIT 161A	Genetics & Biotechnology Lab	6		W	PLS 152 or BIS 101; and 📖
BIT 161B	Plant Genetics & Biotechnology Lab	4		S	PLS 152 or BIS 101; and 📖
FST 102B	Practical Malting and Brewing	4		W	FST 102A; CHE 2C; Open to seniors only in Fermentation Science or Food Science and Technology
FST 104L	Food Microbiology Lab	4		S	BIS 2A; BIS 103; FST 104
FST 123L	Enzymology Lab	2		S	BIS 103, FST 123 (required concurrent)
MCB 120L	Biochemistry Lab	3	F	W	S BIS 102 or 📖
MCB 160L	Principles of Genetics Lab	5	F	W	S BIS 101
NPB 101L	Systemic Physiology Lab	3	F	W	S NPB 101 or NPB 110C
NPB 104L*	Cellular Physiology/Neurobio Lab	4			NPB 101L; BIS 103 or 105
VEN 123L	Analysis of Musts & Wines Lab	2	F		CHE 2C; PLS 21; (8B or CHE 118B or CHE 128B); and VEN 123 ☺; restricted to upper division and grad students in VEN major; 📖
VEN 124L	Wine Production Lab	3	F		VEN 124 ☺, Restricted to undergraduates in fermentation science, viticulture & enology, biotechnology, microbiology, food science and applied plant biology majors; open to graduate students in food science agriculture and environmental chemistry and horticulture

☺ May be taken concurrently

📖 May be taken with consent of instructor

*Not offered regularly

**Offered in alternate years

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